UCRL-JC-124466 Abs

Filamentation and Beam Deflection in Flowing Plasmas: Latest Results*

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It has been recently shown1,2 that transverse plasma flow deflects the laser beam in the direction of the flow. Analytic estimates of a single Gaussian hotspot predict that when the flow is subsonic (M<1, where M is the Mach number flow), beam deflection scales as M/(2-M2)2. F3D simulations support this scaling. Transverse plasma flow also enhances filamentation. Subsonic flow estimates for a single-Gaussian-hotspot are that the spatial gain rate of the beam width scales as 1/(1-M2/2), i.e., filamentation is greater by 50% in plasma with M=1 than in plasma with M=0. F3D simulations show a similar trend. We have also performed a series of simulations quantifying the effects of SSD3 (smoothing by spectral dispersion) with and without multiple color cycles, and different flow profiles on both an f/4 and an f/8 RPP beam. Critically dispersed SSD with ~ 3 of bandwidth (before frequency conversion) is sufficient to suppress beam deflection and filamentation with flow for Scale 1 hohlraum parameters near peak power, I. en, $/n_c$=0. 1,Te = 3 keV, I = 3 x 10^{15} W/cm^2. Multiple color cycles have little benefit on beam deflection or filamentation beyond that obtained with one color cycle bandwidth. The orientation of the SSD dispersion direction with respect to the transverse flow direction has a small effect of beam deflection suppression. On time scales short compare FM cycle SSD itself leads to "beam deflection", an effect that time average the seporied an over FM cycle.

Twenty-Sixth Annual Anomalous Absorption Conference
Fairbanks, Alaska
August 26 - 30, 1996

1. H. A. Rose, Phys. Plasmas 3, 1709 (1996).
2. D. E. Hinkel, E. A. Williams, and C. H. Still, submitted to Phys. Rev. Lett., 01/96.
3. S. Skupsky et al., J. Appl. Phys. 66, 3456 (1989).

* Work performed under the auspices of the U. S. Department of Energy by the Lawrence Livermore National Laboratory under Contract No. W-7405-ENG-48.